Figure 1

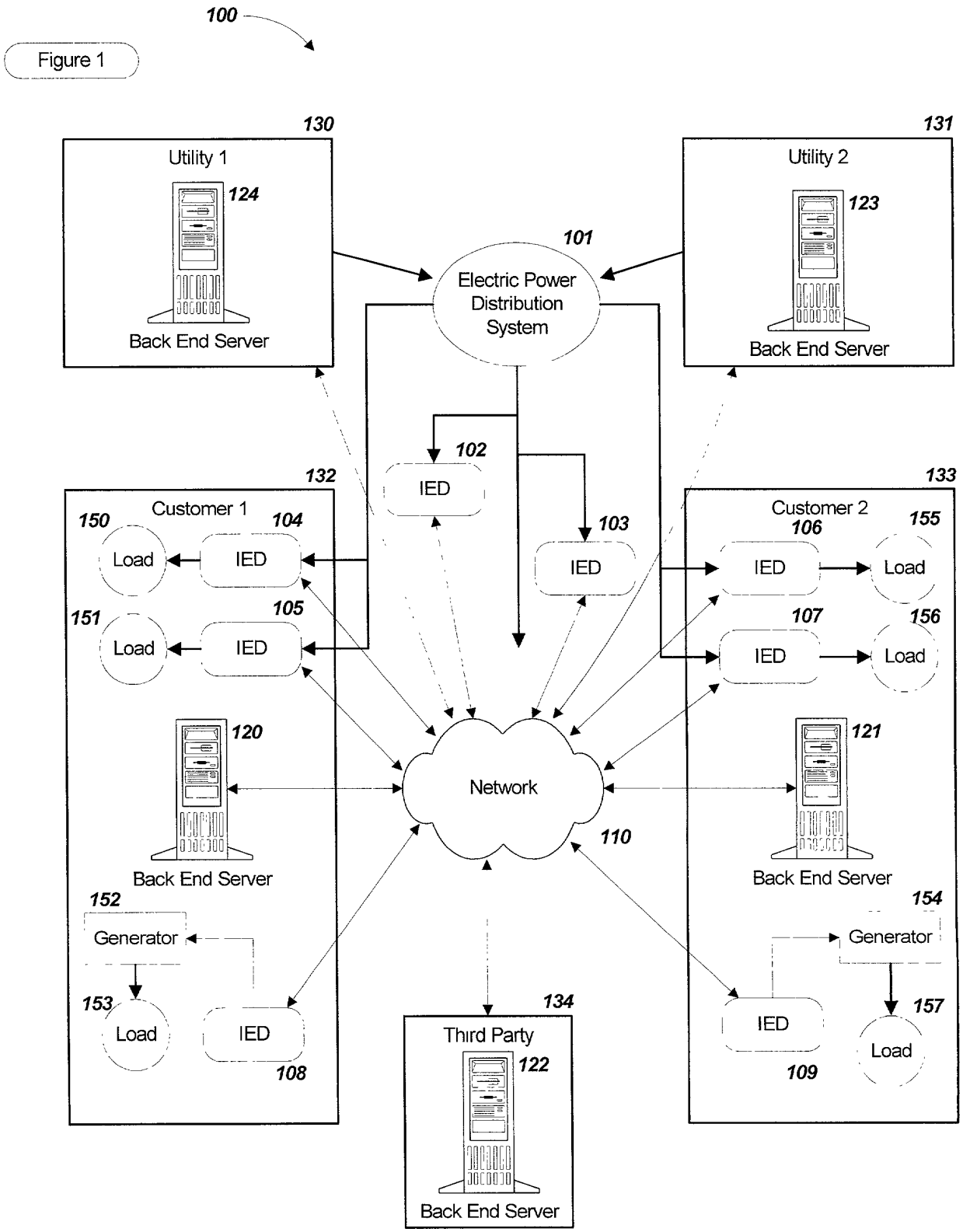

100
130
Utility 1
124
Back End Server
131
Utility 2
123
Back End Server
101
Electric Power Distribution System
102
IED
103
IED
132
Customer 1
150
104
Load
IED
151
105
Load
IED
120
Back End Server
152
Generator
153
Load
IED
108
133
Customer 2
106
155
IED
Load
107
156
IED
Load
121
Back End Server
154
Generator
157
IED
Load
109
Network
110
134
Third Party
122
Back End Server

Figure 2a

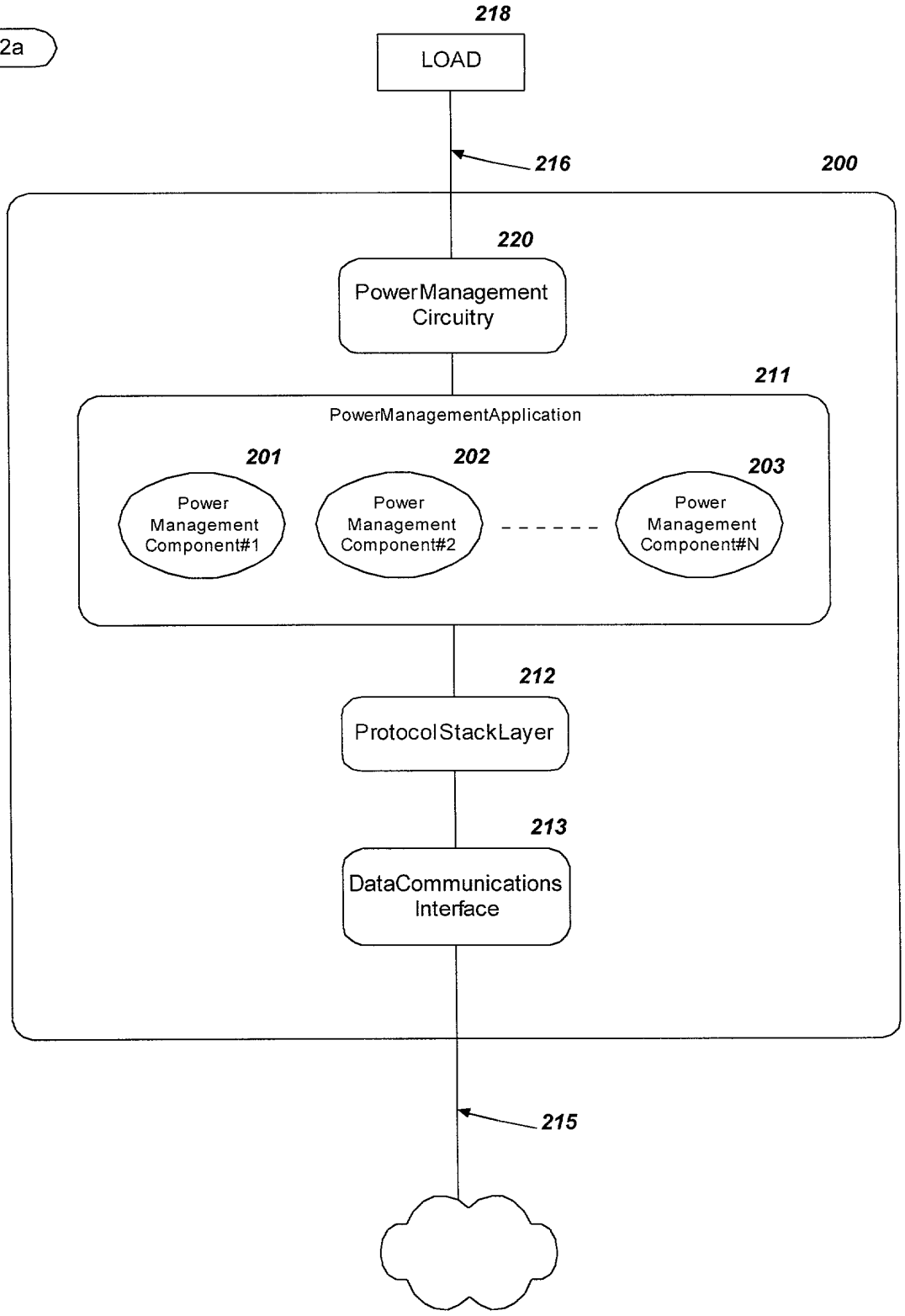

218
LOAD
216
200
220
PowerManagement Circuitry
211
PowerManagementApplication
201
202
203
Power Management Component#1
Power Management Component#2
Power Management Component#N
212
ProtocolStackLayer
213
DataCommunications Interface
215

Figure 3a

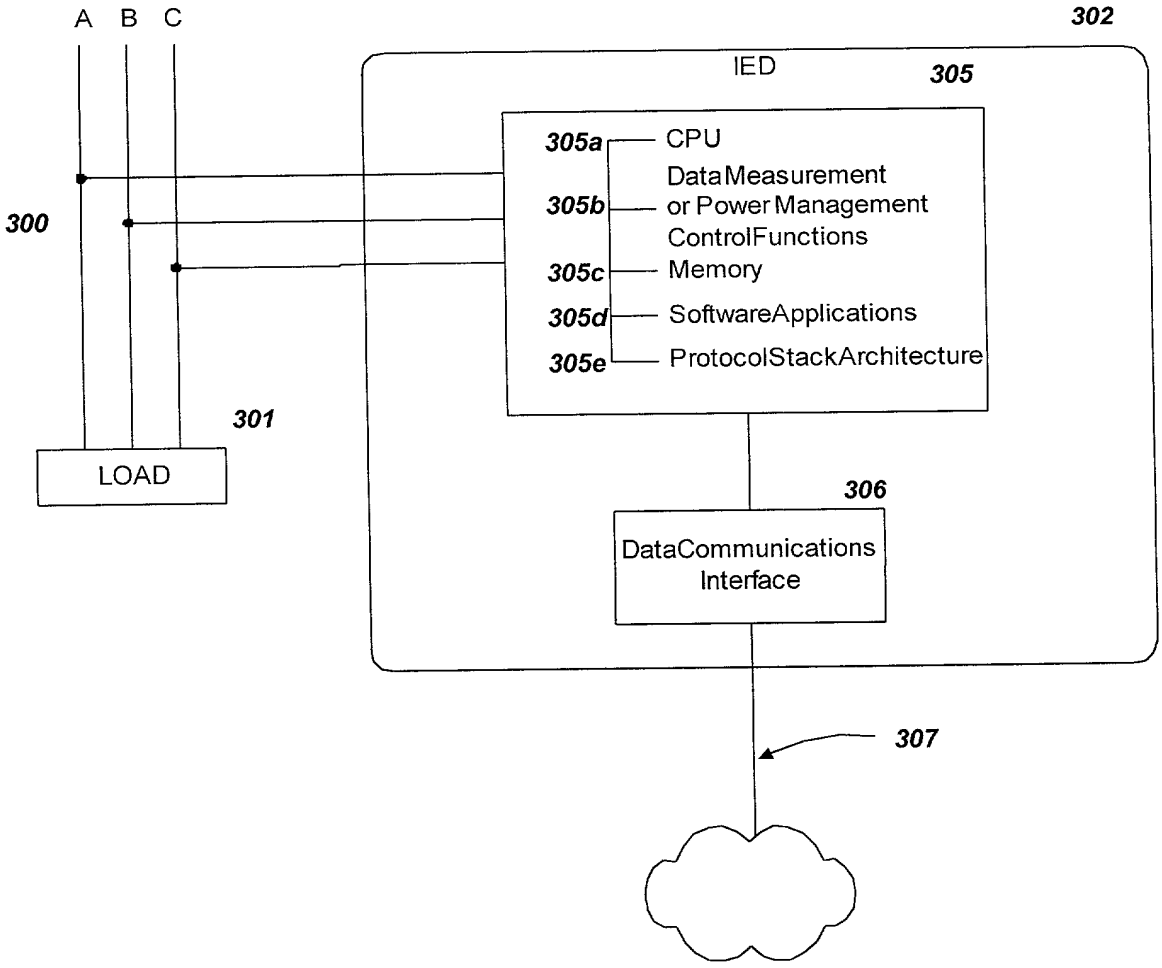

A
B
C
302
IED
305
305a
CPU
305b
DataMeasurement
or PowerManagement
ControlFunctions
305c
Memory
305d
SoftwareApplications
305e
ProtocolStackArchitecture
300
301
LOAD
306
DataCommunications
Interface
307

Figure 3b

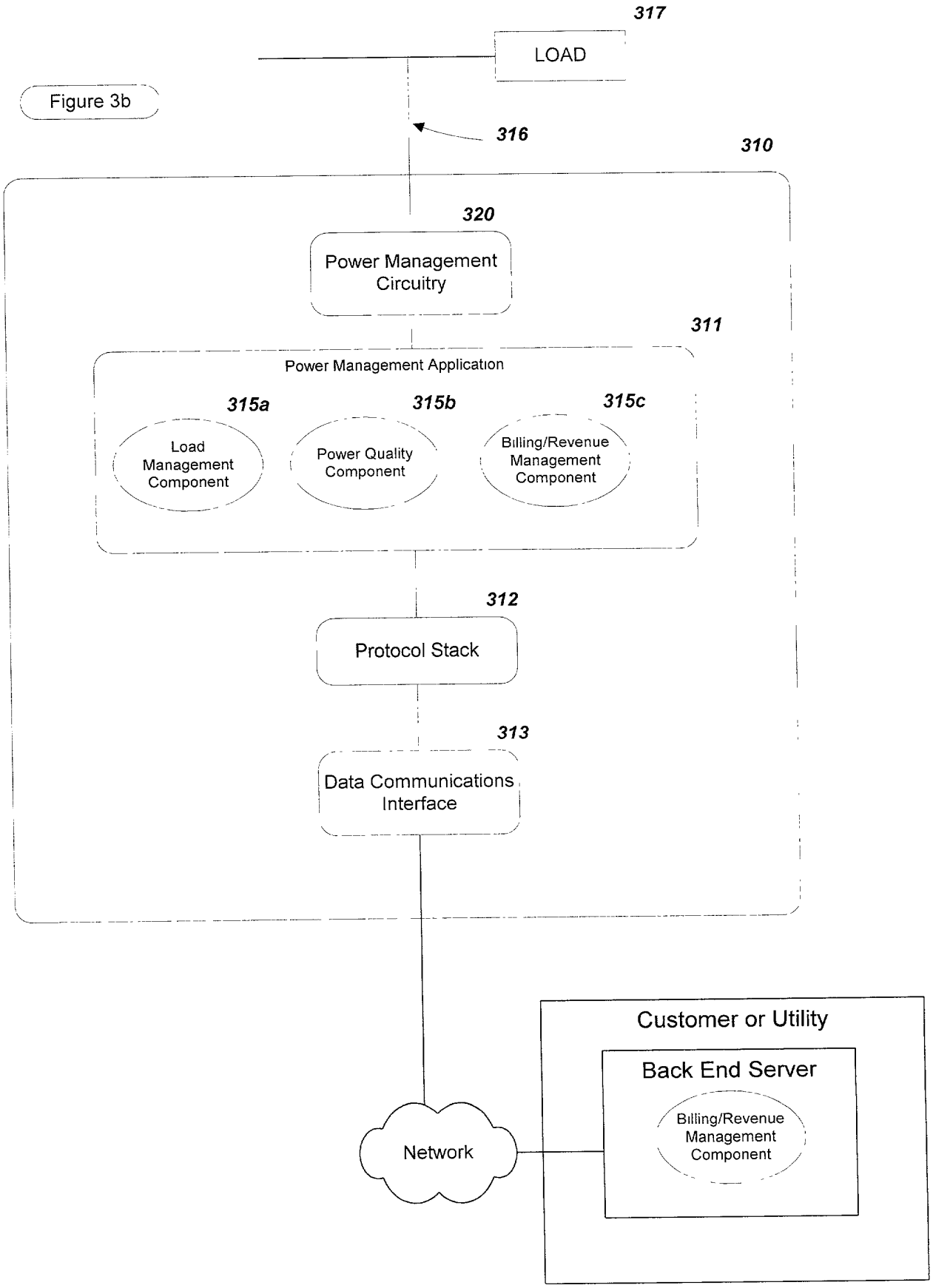

317
LOAD
316
310
320
Power Management Circuitry
311
Power Management Application
315a
Load Management Component
315b
Power Quality Component
315c
Billing/Revenue Management Component
312
Protocol Stack
313
Data Communications Interface
Network
Customer or Utility
Back End Server
Billing/Revenue Management Component

Figure 3c

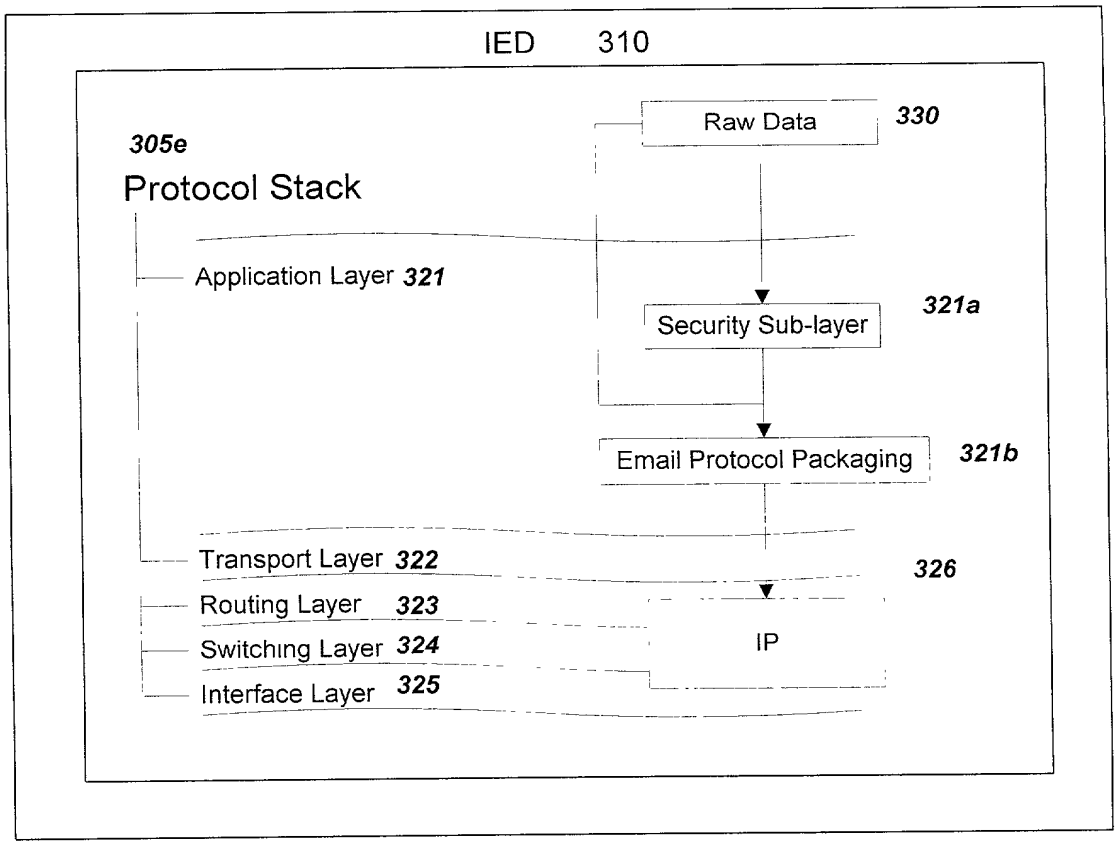

IED 310
305e
Protocol Stack
Application Layer 321
Transport Layer 322
Routing Layer 323
Switching Layer 324
Interface Layer 325
Raw Data
330
Security Sub-layer
321a
Email Protocol Packaging
321b
326
IP

Figure 4a

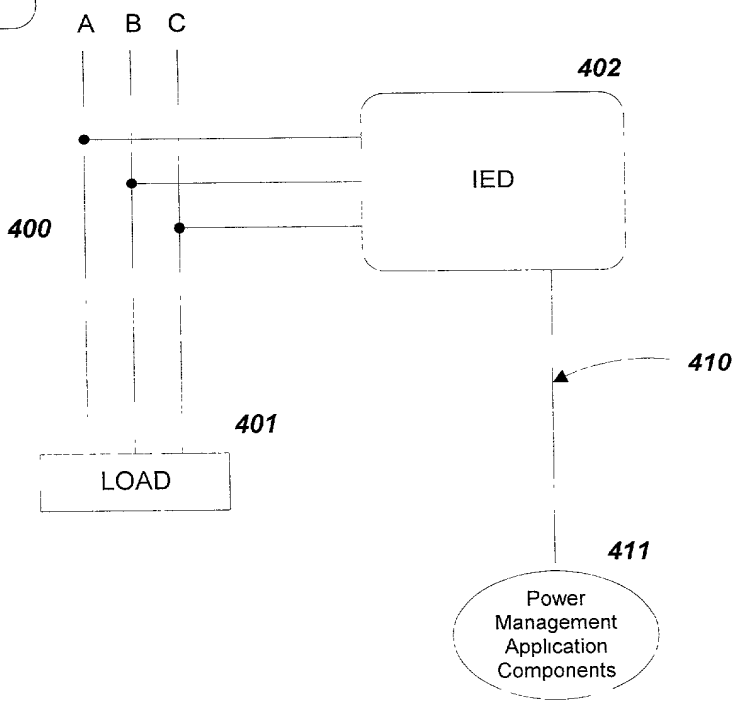

A
B
C
402
IED
400
410
401
LOAD
411
Power
Management
Application
Components

Figure 4b

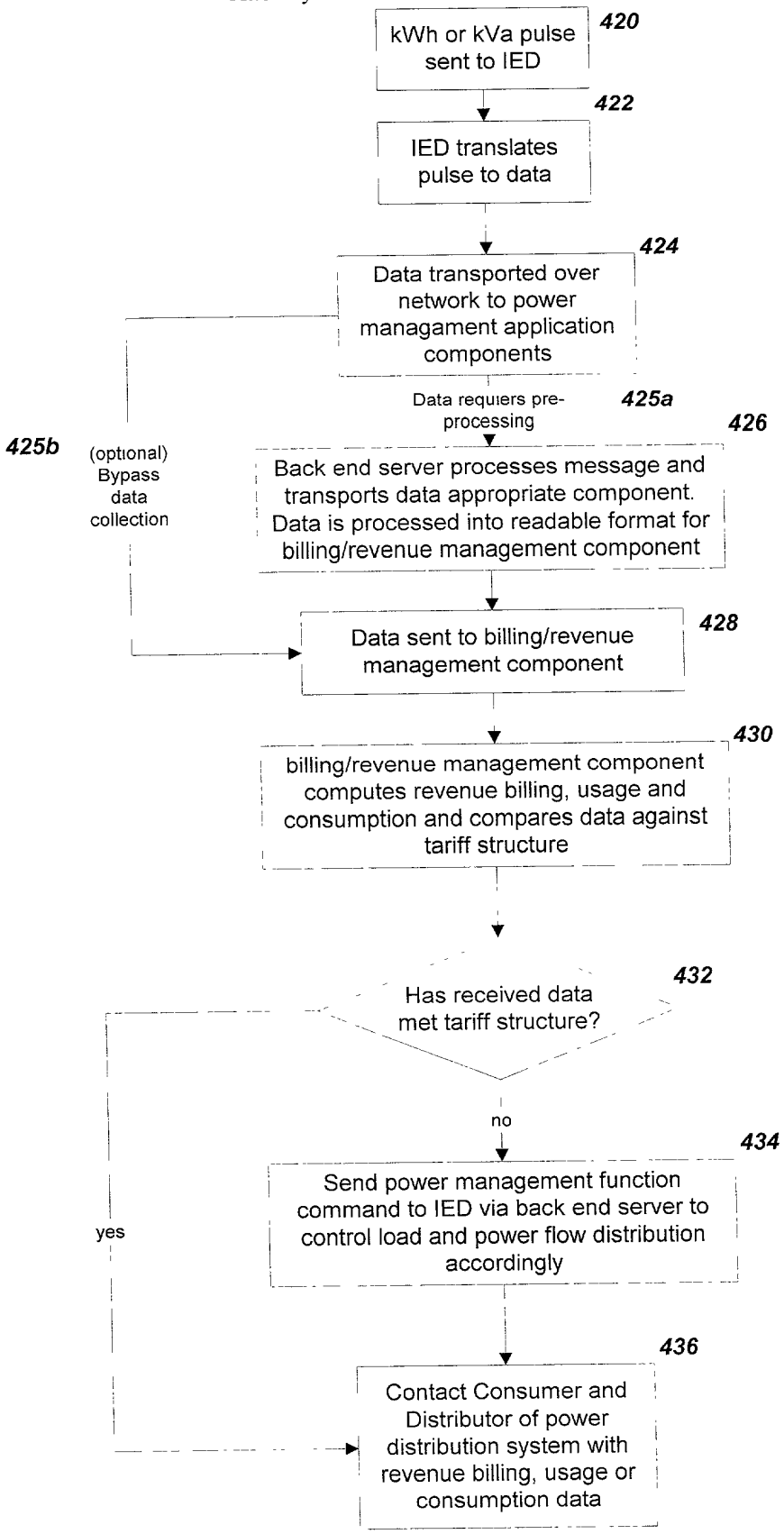

kWh or kVa pulse sent to IED
420
IED translates pulse to data
422
Data transported over network to power managament application components
424
Data requiers pre-processing
425a
425b
(optional) Bypass data collection
Back end server processes message and transports data appropriate component. Data is processed into readable format for billing/revenue management component
426
Data sent to billing/revenue management component
428
billing/revenue management component computes revenue billing, usage and consumption and compares data against tariff structure
430
Has received data met tariff structure?
432
no
yes
Send power management function command to IED via back end server to control load and power flow distribution accordingly
434
Contact Consumer and Distributor of power distribution system with revenue billing, usage or consumption data
436

Figure 5a

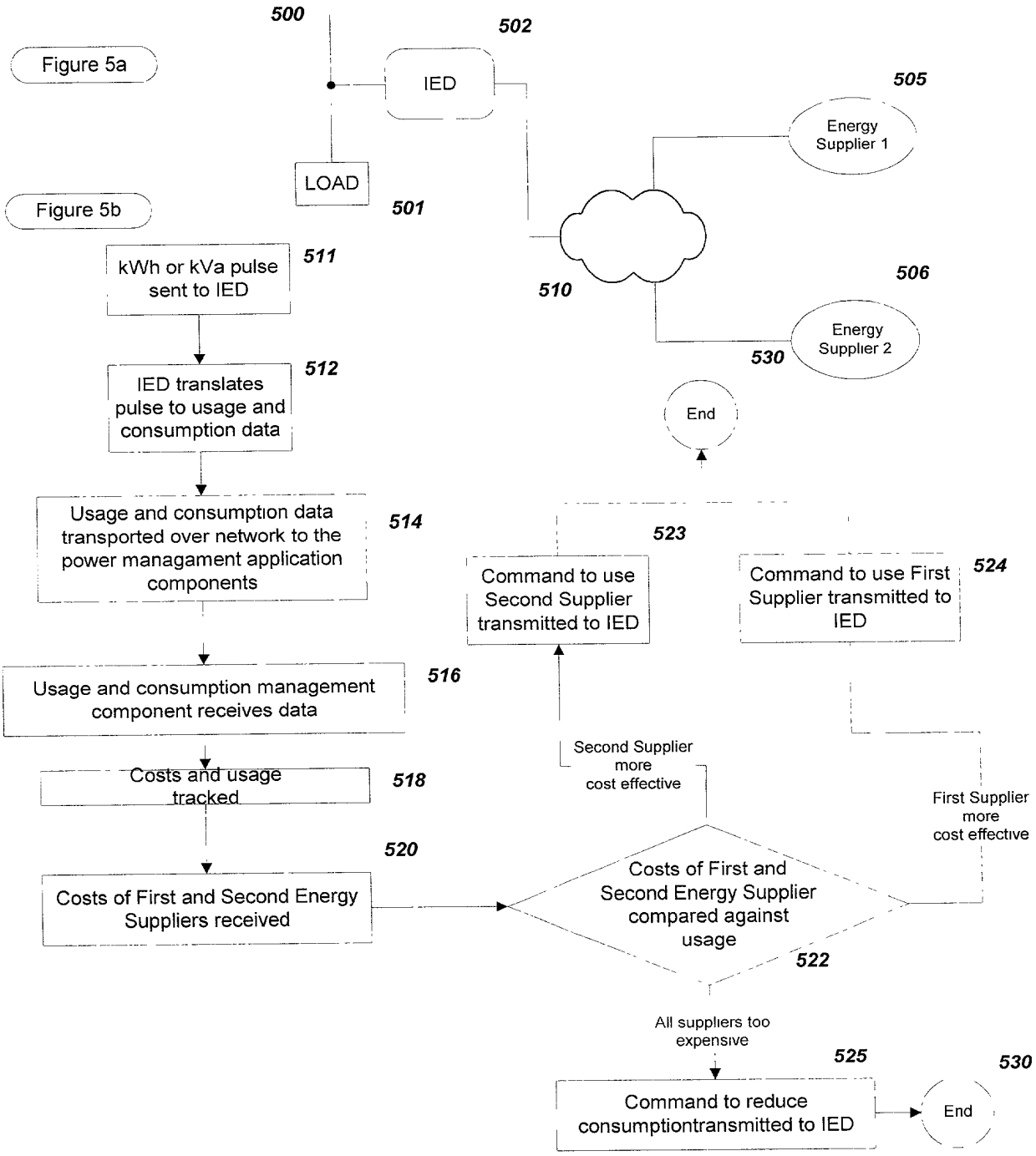
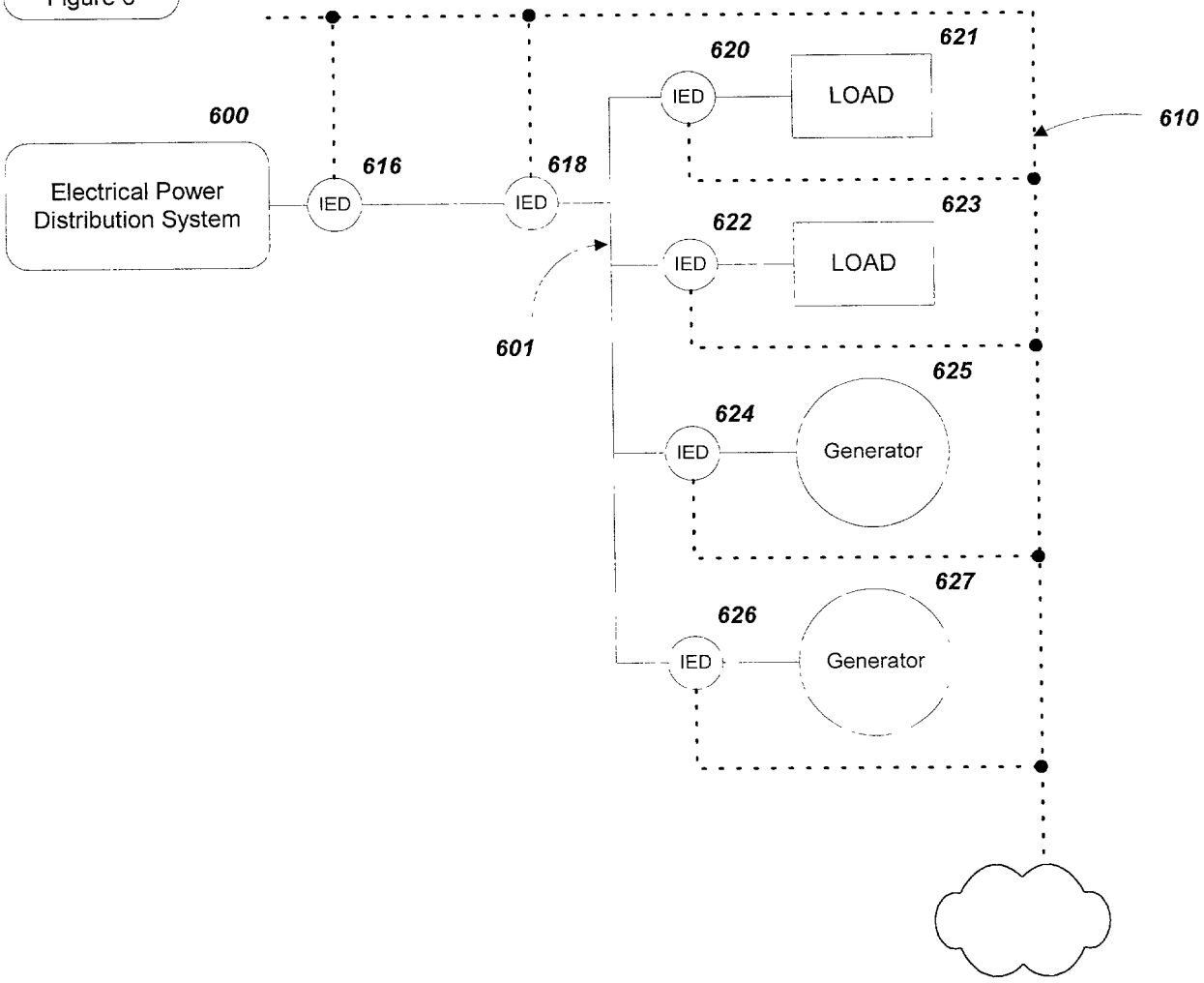


Figure 5b

Figure 6



Docket No. 6270/64

Figure 7

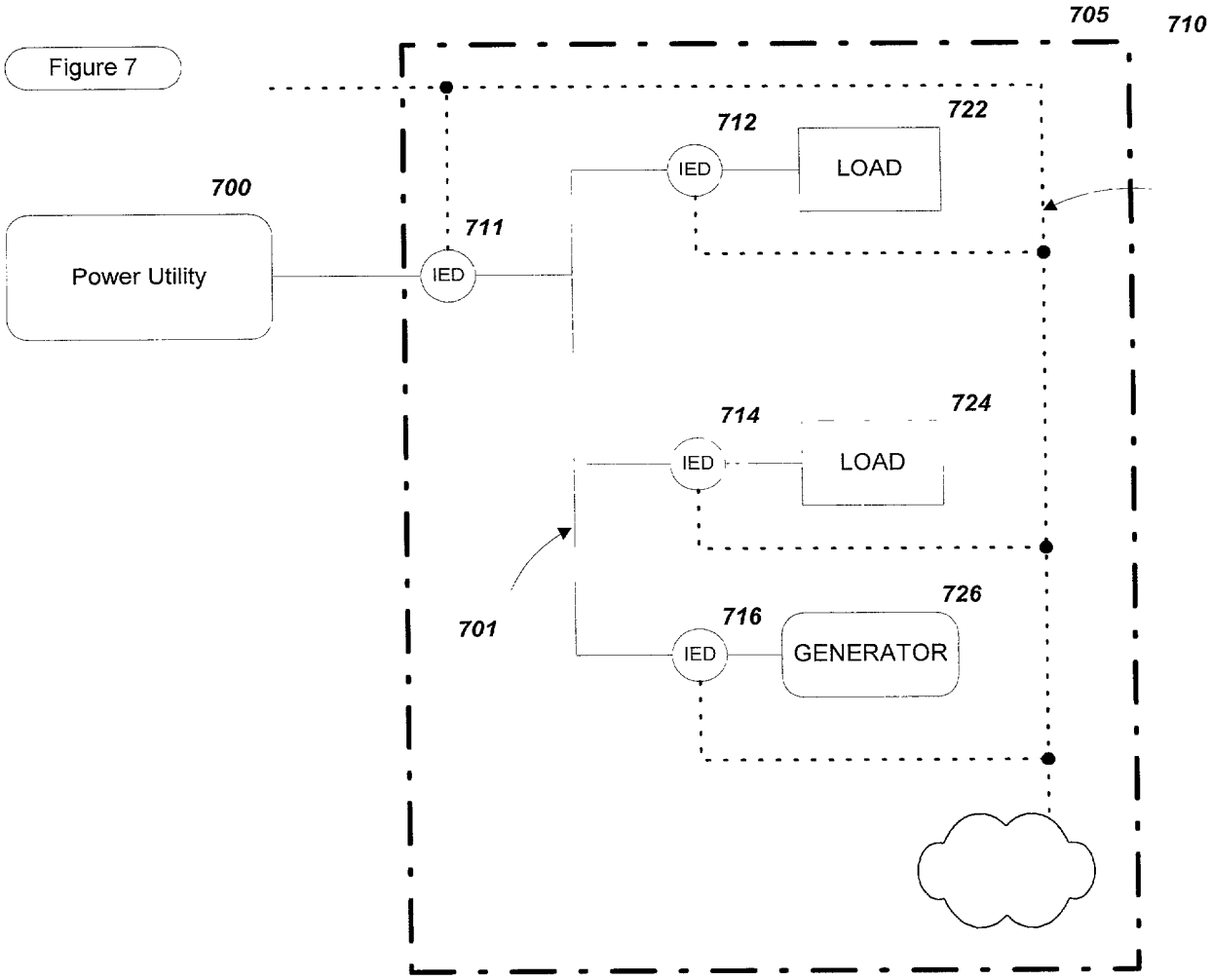

705
710
712
722
LOAD
IED
700
711
Power Utility
IED
714
724
IED
LOAD
701
726
716
IED
GENERATOR

Figure 8

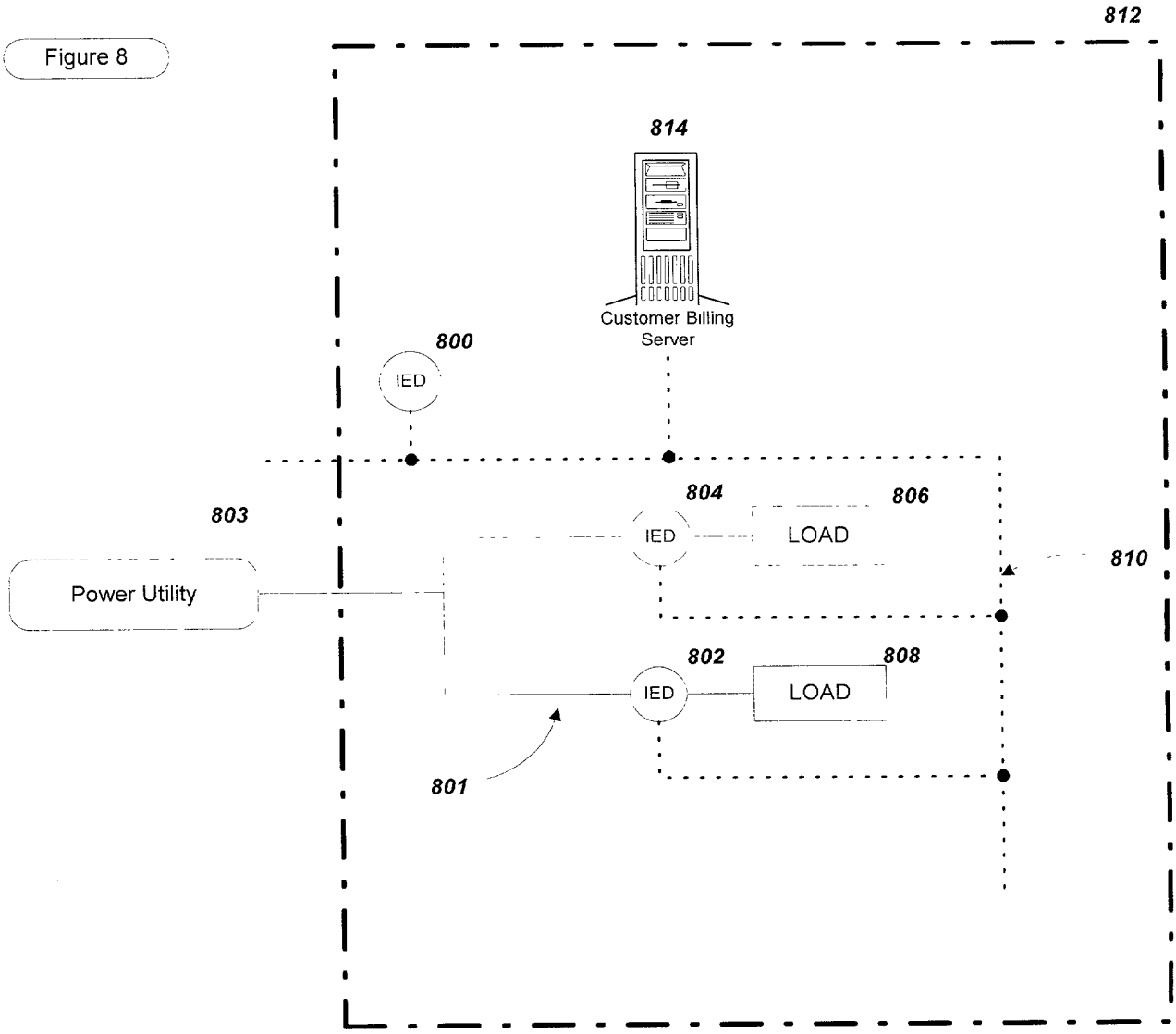

812
814
Customer Billing Server
800
IED
803
804
806
IED
LOAD
Power Utility
810
802
808
IED
LOAD
801

Figure 9

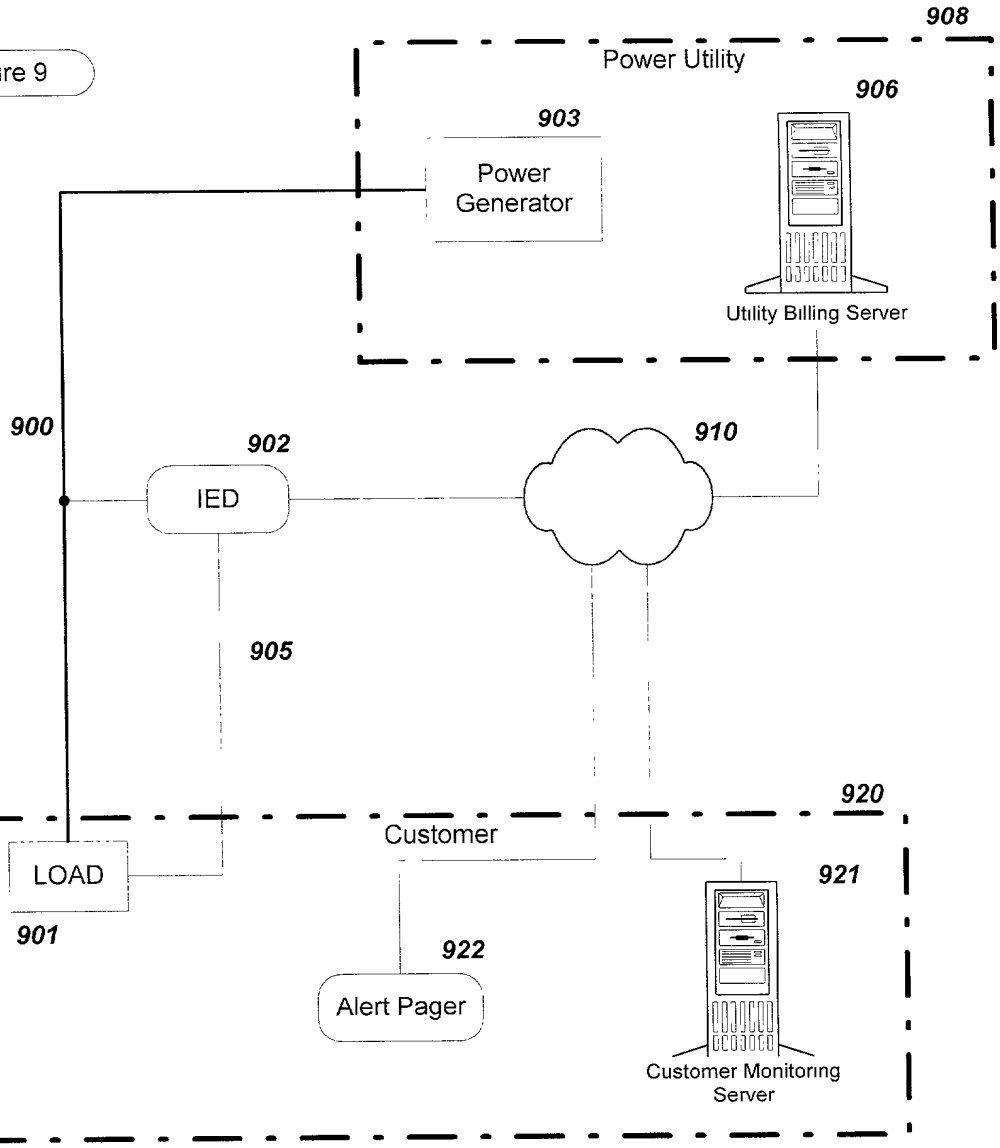
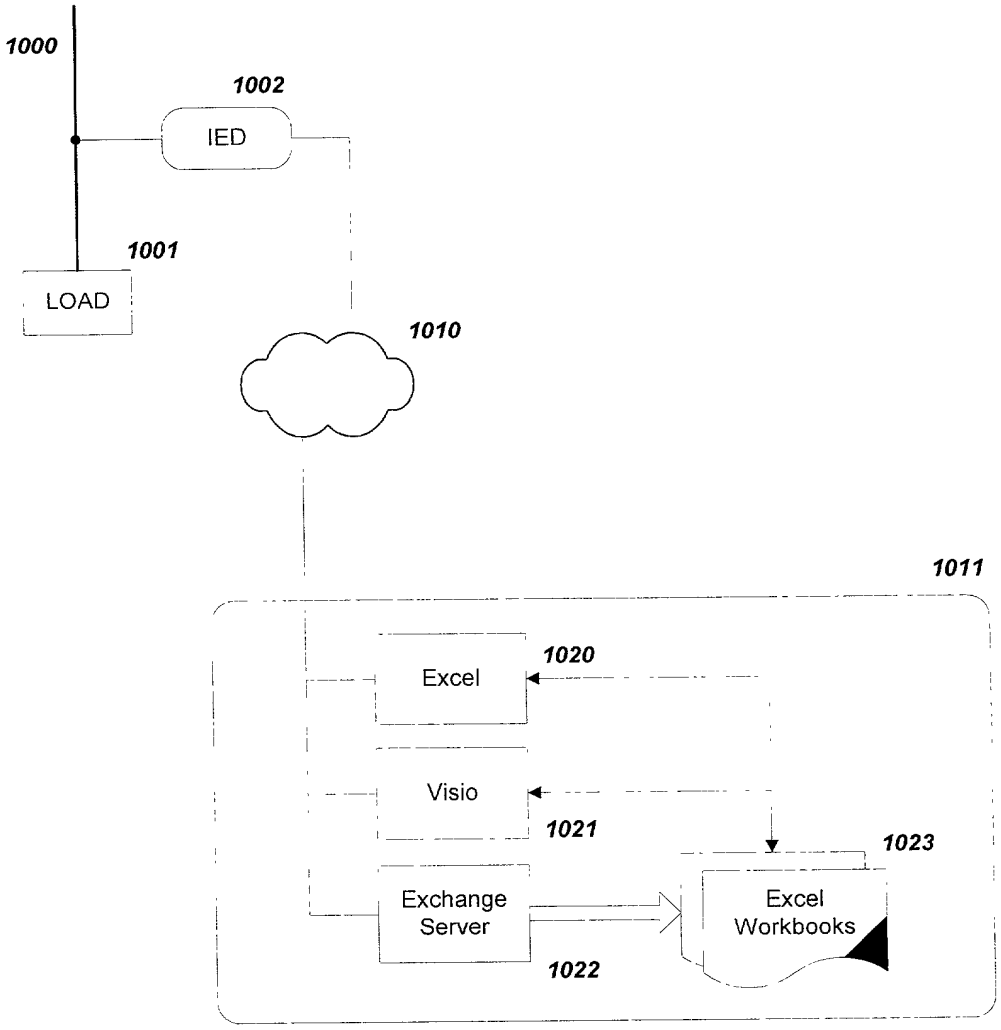

908
Power Utility
906
903
Power Generator
Utility Billing Server
900
902
910
IED
905
920
Customer
LOAD
921
901
922
Alert Pager
Customer Monitoring Server

Figure 10


1000
1002
IED
1001
LOAD
1010
1011
1020
Excel
Visio
1021
1023
Exchange Server
Excel Workbooks
1022

Site1.a8500

Default Diagram

LABEL	VALUE
I a	197.97
I b	207.52
I c	237.82
Vln c	479.28
Vln b	371.46
Vll ca	580.46
Vll ab	589.1
Vll bc	586.28
Vll avg	585.28
Vln avg	357.23
I avg	214.44
PF sign tot	-94
Freq	59
CL1 LocalTime	08:32.9

Sum of Currents: 643.31

Formula-based Setpoint: OVER 550 Volts

Change Update Rate 10
Type in the number of seconds you would like between page updates and hit <RETURN>

Some features to implement:
Auto-detection: Excel could automatically add a worksheet (a "tab" below) when it detects a new device on the network
Complex Aggregation: Because it is Excel, you can do anything you want, easily
Logging: You could write simple scripts to log the values on the left to an Access DE
Animation: Charts, warnings, etc
Onboard logs could be displayed easily
Default diagrams: we just need to create an excel template for each device

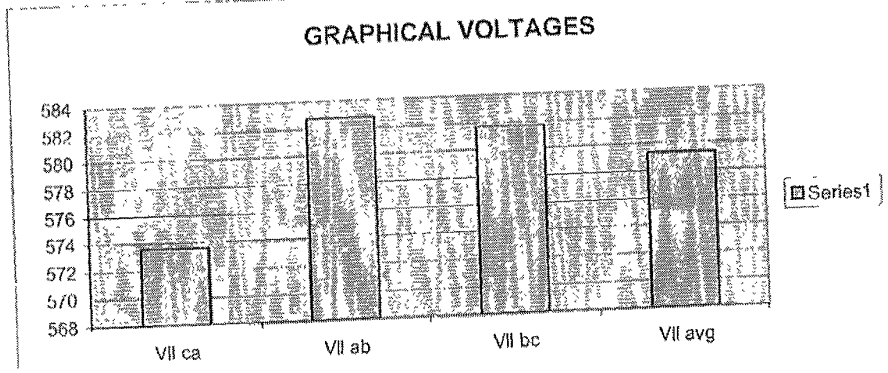


Figure 11

Figure 12

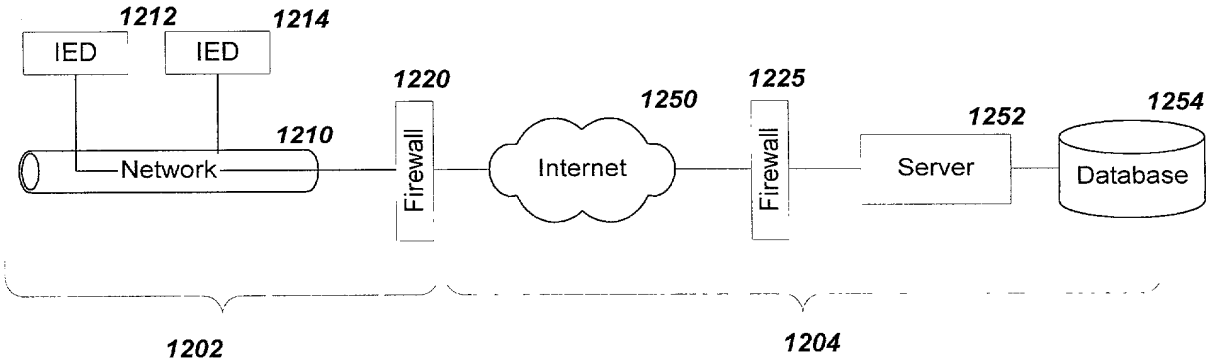


Figure 13

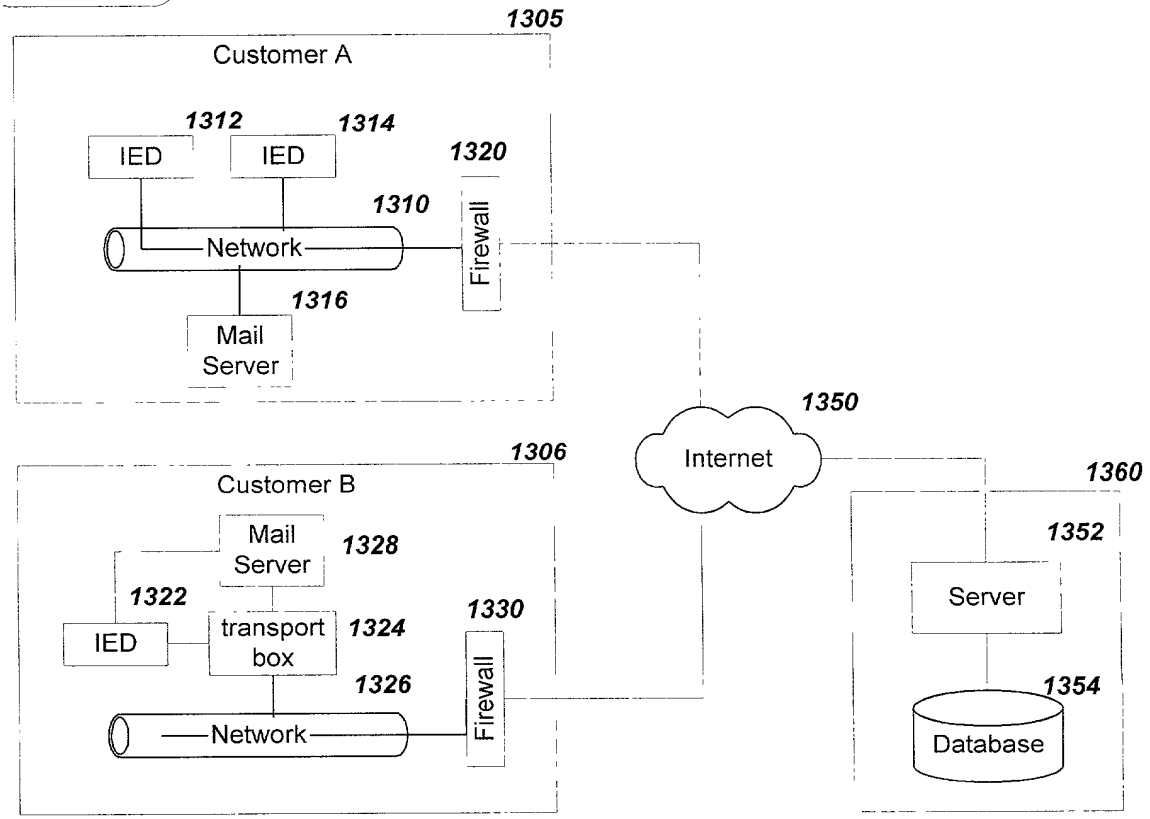


Figure 14

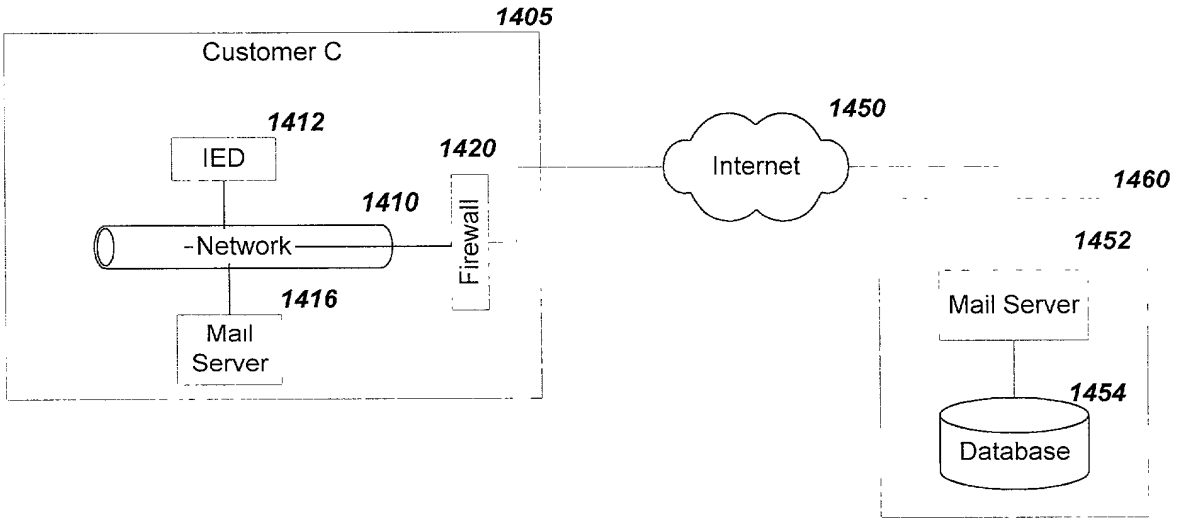

1405
Customer C
1412
IED
1420
1410
Network
Firewall
1416
Mail
Server
1450
Internet
1460
1452
Mail Server
1454
Database

Figure 15a

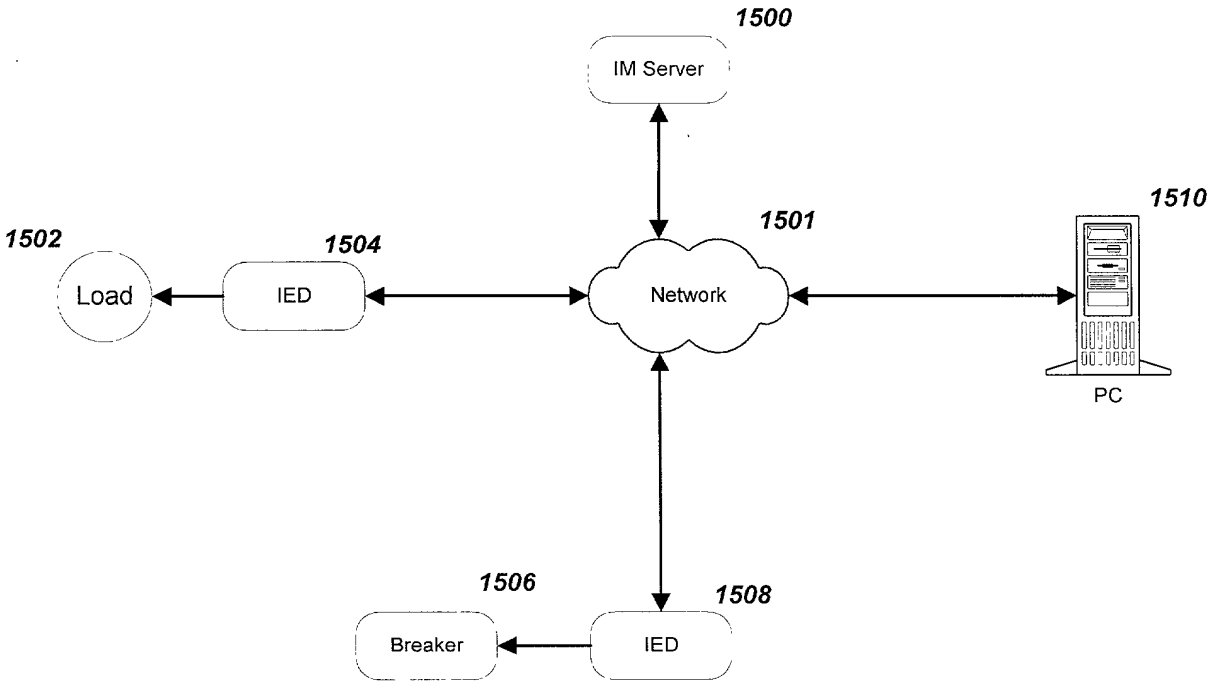

1500
IM Server
1501
1502
Load
1504
IED
Network
1510
PC
1506
Breaker
1508
IED

Figure 15b

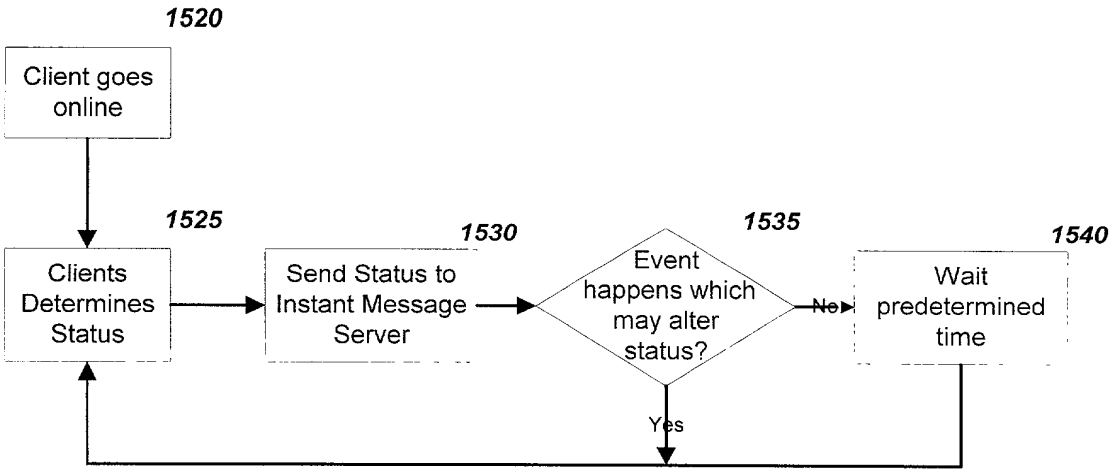


Figure 15c

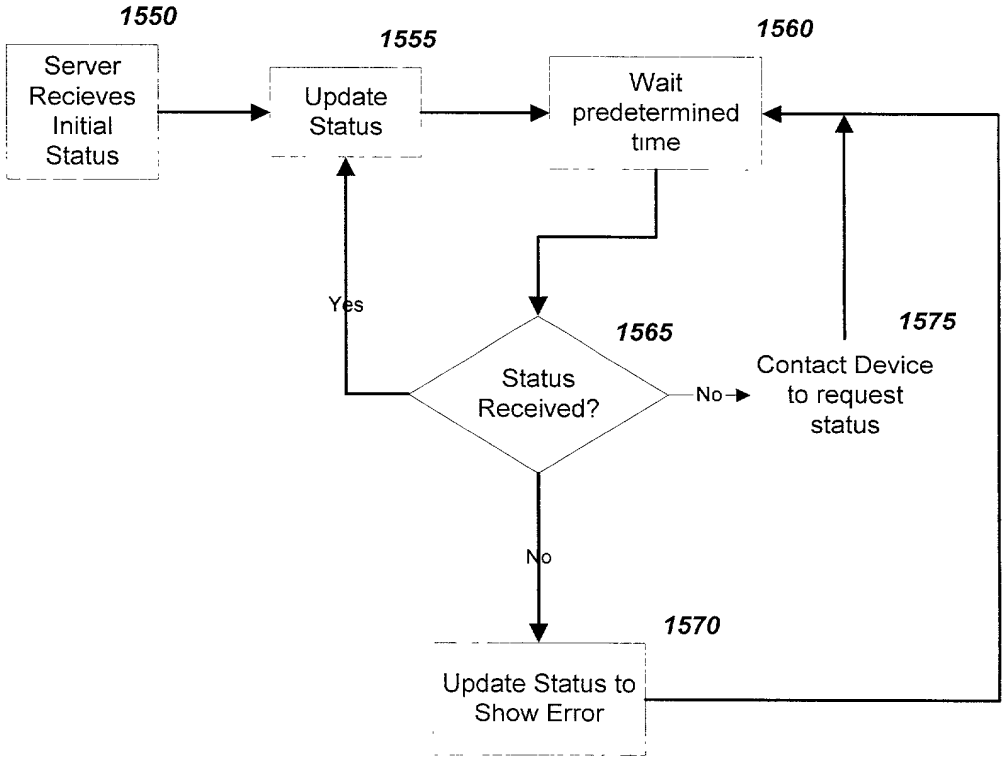


Figure 16

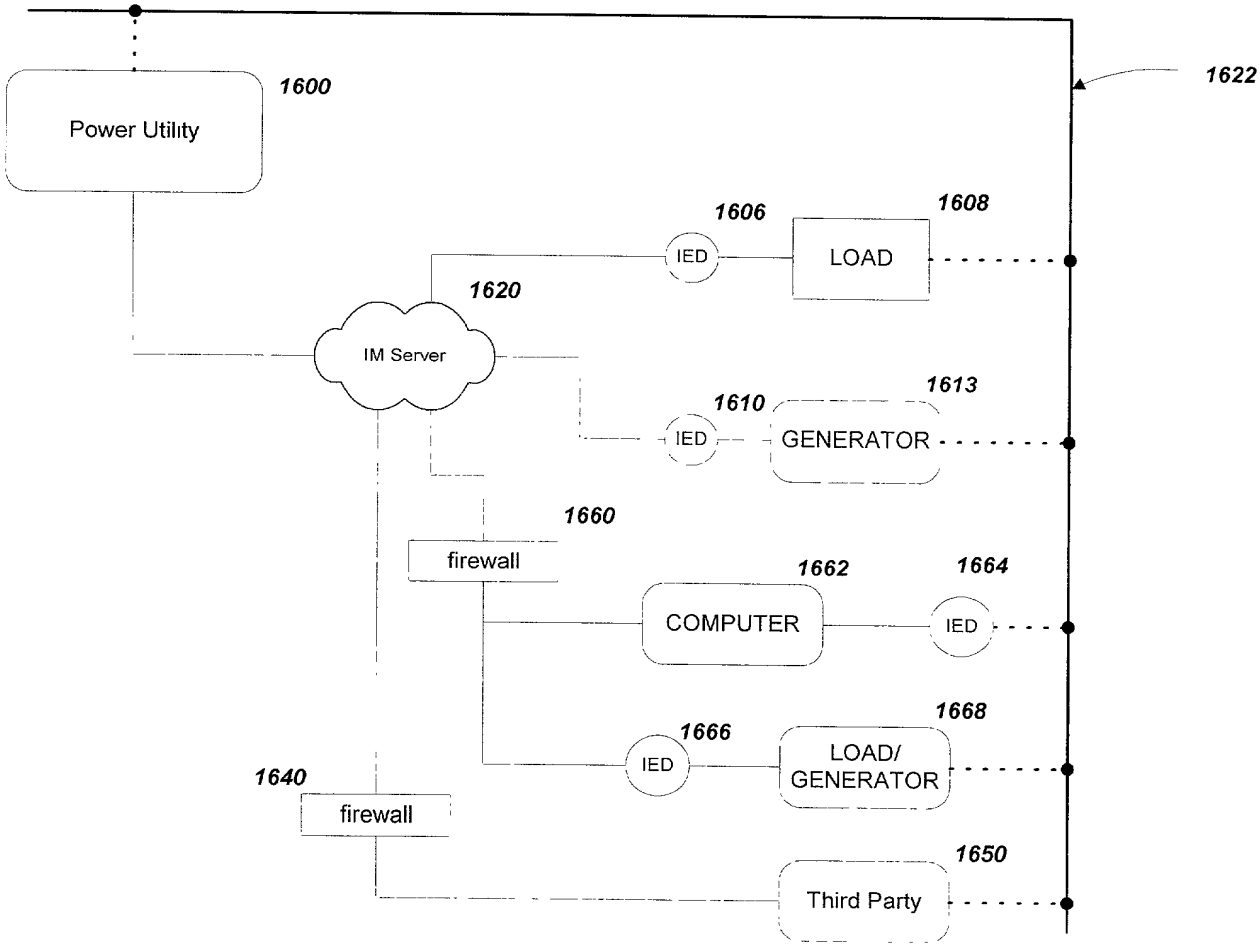
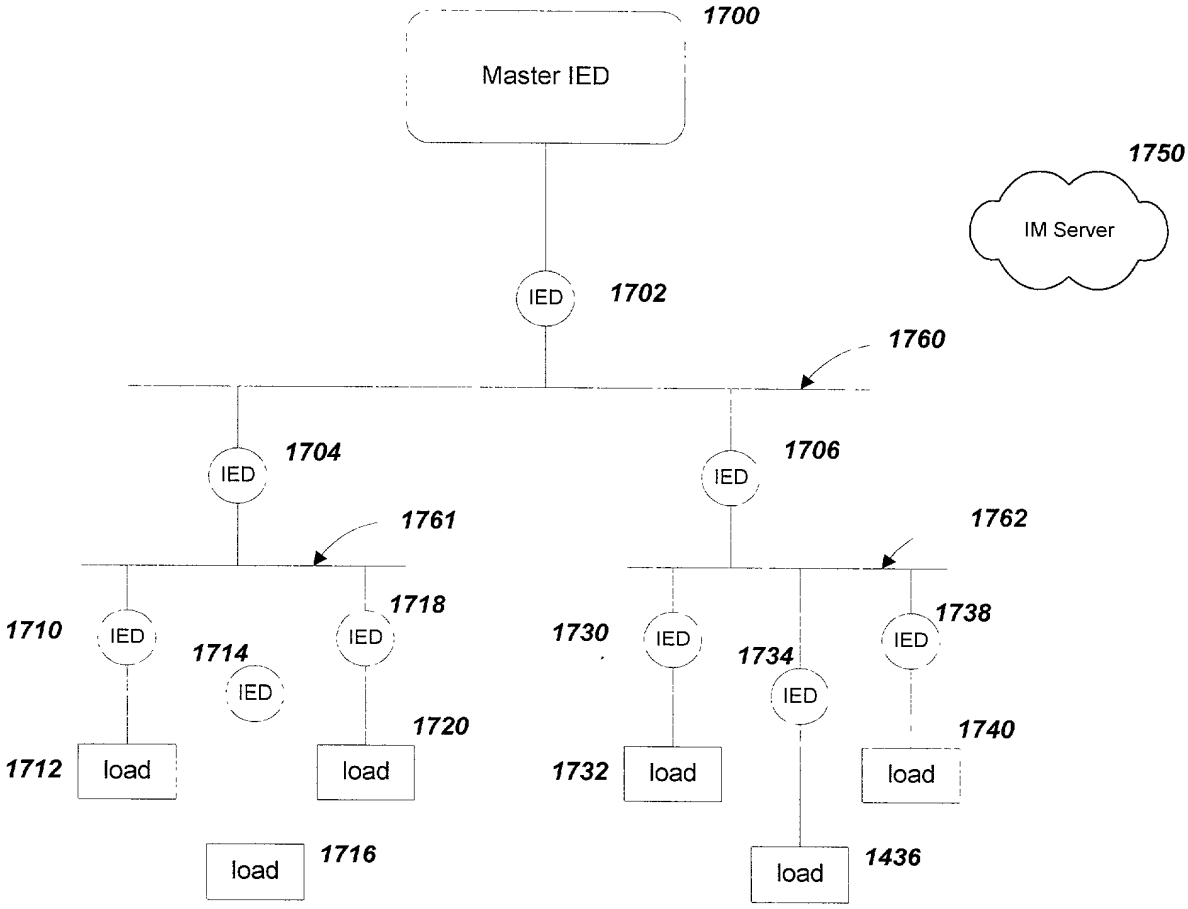

1600
Power Utility
1622
1606
IED
1608
LOAD
1620
IM Server
1610
IED
1613
GENERATOR
1660
firewall
1662
COMPUTER
1664
IED
1666
IED
1668
LOAD/
GENERATOR
1640
firewall
1650
Third Party

Figure 17


1700
Master IED
1750
IM Server
IED
1702
1760
IED
1704
IED
1706
1761
1762
1710
IED
1718
1714
IED
IED
1738
1730
IED
1734
IED
1720
1740
1712
load
load
1732
load
load
load
1716
load
1436